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Innovating for Learning: Designing for the Future of Education

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Abstract: Teaching has moved online as the world has moved online and learning is losing its sense of physical location with the availability of many different options from mobile to MOOC (Massive Open Online Course). The impact of online learning is not confined to distance learning; when a student attends a campus university they are now as likely to meet with their fellow learners virtually as face to face. The education sector has yet to fully adapt to what this means, and indeed there strong signs of a built in resilience from providers, employers and students themselves which may mean an apparent evolution is more likely than a revolution. At the same time, there are some quiet changes underway that mean we should be preparing to innovate for the revolution to come. Some of those changes are considered in work undertaken at The Open University that has been disseminated in a series of Innovating Pedagogy reports. These reports allow the academic authors to be more speculative than is usual practice and engage in considering the future, while remaining based on a view of what is happening in the sector. In particular they adopt a position focused on pedagogy that balances technology-based futurology that can dominate yet fail to resonate with those actually involved in the teaching process. The annual Innovating Pedagogy reports cover 10 topics each, with some deliberate overlap from year to year and development of themes that show innovations moving into teaching practice. This is illustrated by two cases, the impact of MOOCs and the application of learning design and analytics. The development of MOOCs demonstrates the value of reviewing pedagogy that aligns with technology. While the use of learning design and learning analytics demonstrates how improvements in the way we describe our learning processes and the way we understand learner behaviour is helping determine how choices in pedagogy impact on student satisfaction, progression and success.

Keywords: innovation, learning design, learning analytics, MOOCs, openness

1. The innovating pedagogy reports

The Open University has produced three annual reports looking at innovations in pedagogy. The first report was generated in 2012 (Sharples et al., 2012). The concept has similarities with the NMC Horizon Report Higher Education Edition that is also produced annually and is coordinated by EDUCAUSE working with the New Media Corporation (Johnson et al., 2015). The NMC Horizon report sets out to help readers “understand the impact of key emerging technologies on education”. Those reports are well regarded and provide sources of good advice, however with a focus on technology the NMC Horizon report is led by changes in the environment. Technology has an established pattern, illustrated by the “Gartner Hype Cycle” (Figure 1), of high expectations followed by disappointment before more realistic aims might be achieved. This hype cycle has certainly been evident for technologies for learning: examples include virtual environments such as Second Life and hardware such as LaserDiscs and Personal Digital Assistants. The Innovating Pedagogy reports take an alternative position leading with pedagogy rather than implementation. While the subject may be the same, for example Learning Analytics feature in the NMC Horizon report in 2012 and the initial Innovating Pedagogy report in the same year, the treatment differs. The focus on pedagogy in the reports often reflecting a longer view of time to adoption and lower expectation of quick impact. The reports also highlight approaches that can sometimes be overlooked, for example topics covered have included seamless learning and crowd learning.

The Innovating Pedagogy reports have been produced by a small team from The Open University, the majority from the Institute of Educational Technology (IET). The development of the document has been led for the last four years by Professor Mike Sharples and deliberately takes a light and agile approach involving around eight to ten people in the process. His initial message for the first report asked “can each of you please do some creative thinking and let me have at least two (preferably more) suggestions for future and emerging innovations in pedagogy. Don’t worry at this stage about grammar, coherence, sanity – just get the ideas down.” This generated a long list of topics that were prioritised, ranked, developed as short descriptions and then expanded into long descriptions. Throughout the process editing was shared and the end result is a genuinely collective document. Some academic rules were relaxed; emphasis placed on communicating ideas rather than ensuring all points had directly referenced sources. The reports therefore represent opinion, but with foundation. That foundation in part comes from the base in the Institute of Educational Technology. IET was established in 1970, shortly after The Open University itself, and combines understanding of the function of the University, globally available teaching in Online and Distance Education, and externally supported research into educational technology. In 2015 the approach for the report is taking a new direction, involving authors from SRI

International alongside those from The Open University. SRI International shares a similarly long history, originally founded as Stanford Research Institute in 1970, and the broader perspectives is helping to refresh views for the fourth report in the series.

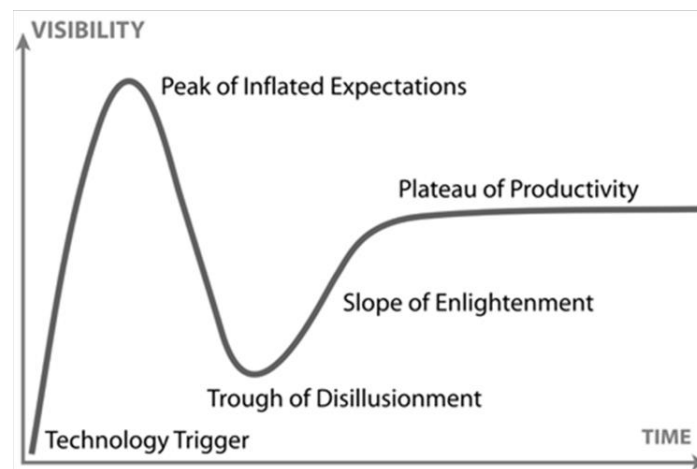


Figure 1: The Gartner Hype cycle (image from Jeremykemp(2007))

2. Innovating in education

The reports are intended to help with the process of innovation in Education. How people learn is changing and innovating, however the organisations that underlie education have a built in conservatism that can pull against innovation and adoption of change. If we imagine someone from 100 years ago visiting a typical modern university it could appear that, while the bricks may have been replaced by coloured glass, much of what takes place will be familiar. The lecture theatre, tutorials and fundamental idea that three-years spent in one place will change your life remain. Education has proved itself to have resilient structures that are not easily changed. Weller and Anderson (2013) look at this resilience in itself as having potential to allow experimentation and prove a basis for innovation, particularly around changes through digital enablers, and identify that “In terms of higher education practice then, resilience is about utilising technology to change practices where this is desirable, but to retain the underlying function and identity that the existing practices represent, if they are still deemed to be necessary” (Weller and Anderson, 2013). The change process that needs to be implemented faces recognised challenges in adoption and diffusion of innovation. The Innovation Pedagogy reports seek to build on the culture of greater openness as a key to innovation, and in particular the mechanism of shared discussion of innovating pedagogy as a way to disseminate ideas. The dissemination is both in terms of the approach to innovation, and also of the ideas and topics that have potential to gain traction and impact at the cross-over from informal to formal learning.

2.1 Incubating innovation

Supporting innovation is a challenge with the tension of disruption that can mean change is a painful process. As stated by Casanovas (2010) “Online education can be seen as innovation, accordingly with the classic widely accepted definition of innovation as the adoption of an idea or behaviour that is new to an organization” and so faces the challenges of acceptance that apply to innovation. The classic representation of innovation (Rogers, 1995) leads from enthusiasts who are early adopters through to laggards who trail after main-stream adoption. The diffusion curve of innovation provides a fundamental shape: a slow increase, followed by a sharp rise and then a gradual plateauing to an eventual adoption level. This curve has a certain reassurance to those working in education (and probably many other fields), it implies that we can expect to have limited interest in an innovation as we start to work on it, have more people pay attention to it when its time has come and then achieve wider, though not universal, reach in the fullness of time. On the other hand, Rogers’ work can be seen as less about the inevitability of different levels of adoption, rather that when innovating we must take steps to address how we are disseminating and diffusing the innovation so that the steepest rise in the curve is achieved. In effect the aim becomes to pull the curve towards the left in Figure 2 (based on Figure 1-1 from Rogers(1995)) and to see “diffusion as information-exchange” (Rogers, 1995; xvi).

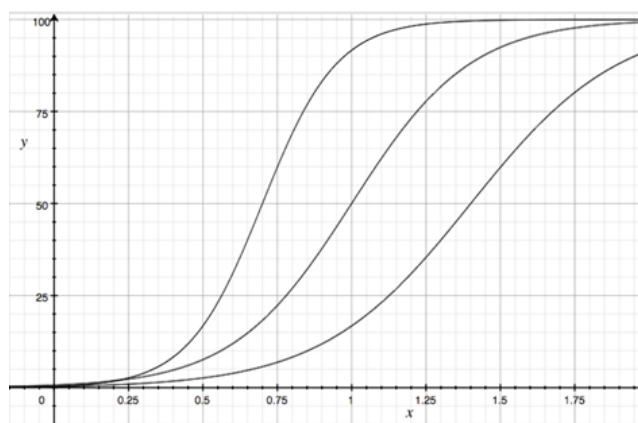


Figure 2: Innovation s-curve showing adoption over time

2.2 Openness in innovation

Innovation into practice therefore requires a process of dissemination. In work supported by the EU-funded Open Education for Incubating Innovation (OEII), fifteen case studies led towards recognition that openness itself acts as a catalyst for innovation, and actions can be designed to support a process of innovation. A series of recommendations from the OEII project (Brasher et al, 2013) considered how policy, institutional and individual action could influence innovation:

- Harness passion and apply individual motivation;
- Build on what others have done and join in open action; but also ...
- Be prepared to create your own approach and system;
- Innovate on existing objectives e.g. to achieve reach, move online, become more international;
- Be a user of the innovations and avoid producing just for others;
- Stay in touch and be involved in the path of innovation;
- Experiment at different scales from individual to massive.

Overlaying these elements was the way in which operating in the open enhances the diffusion required for innovation. Openness has changed the way in which we access and share knowledge, for example academic access to articles has moved from individual subscription, through library facilitation to online (Tenopir et al., 2009). As the openness of access increases, particularly through electronic means, they found it to “change reading patterns, including reading more and relying more on electronic sources”. Just as with journal articles, this applies to less formal literature and the potential for academic ideas to go viral (such as the YouTube video on “The Machine is Us/ing Us” by Michael Wesch, which has now achieved over 12million views (Wesch, 2007)). Engaging in this open approach has been part of the motivation in seeking to develop a more accessible format for work on the underlying pedagogy of online learning and teaching reflected in the Innovating Pedagogy report series.

3. Areas in the Innovating pedagogy reports

The topic titles from the first three reports are shown in Table 1. In the first year (published in 2012) the report aimed for discussion that considered learning approaches rather than technical drivers. Several influences brought this concept together with credit in particular to the then Director of IET, Professor Josie Taylor, in identifying the need within the University to take a position on pedagogy through an approach of open innovation, and to Professor Mike Sharples for providing individual leadership and rapidly building consensus around the report format.

Table 1: Topics in the innovating pedagogy reports

2012	2013	2014
New pedagogy for e-books Publisher-led short courses Assessment for learning	MOOCs ¹ Badges to accredit learning ¹ Learning analytics ¹	Massive open social learning Learning design informed by analytics Flipped classroom

2012	2013	2014
Badges to accredit learning MOOCs Rebirth of academic publishing Seamless learning Learning analytics Personal inquiry learning Rhizomatic learning	Seamless learning ¹ Crowd learning Digital scholarship Geo-learning Learning from gaming Maker culture Citizen inquiry ¹ Revisited from 2012	Bring your own devices Learning to learn Dynamic assessment Event-based learning Learning through storytelling Threshold concepts Bricolage

For comparison Table 2 shows the topics that appear in the last four NMC Horizon reports, note that the publication of NMC Horizon reports is typically in Spring of each year, whilst the Innovating Pedagogy reports appear in Autumn. Taking the topics in the 2012 as an example, the NMC Horizon report considers four topics that have a clear technology base (Mobile Apps, Tablet Computing, Gesture-Based Computing and Internet of Things) together with two that can be seen as more related to their particular use in learning (Game-Based Learning and Learning Analytics). Arguably in the most recent report from early 2015 that split has been reversed with four learning focussed topics (Bring Your Own Device, Flipped Classroom, Makerspaces and Adaptive Learning Technologies). The 2015 report has also extended the range covered to include the educational challenges and trends as well as technologies.

Table 2: Topics in the NMC Horizon reports

2012	2013	2014	2015
Mobile Apps Tablet Computing Game-Based Learning Learning Analytics Gesture-Based Computing Internet of Things	MOOCs Tablet Computing Games and Gamification Learning Analytics 3D Printing Wearable Technology	Flipped Classroom Learning Analytics 3D Printing Games and Gamification Quantified Self Virtual Assistants	Bring Your Own Device Flipped Classroom Makerspaces Wearable Technology Adaptive Learning Technologies The Internet of Things

The gradual development of greater focus on pedagogy in the NMC Horizon Report series is echoed by increasing research based writing in educational technology. This is building on a relatively low base, for example Kirkwood and Price (2014) found less than 50 articles published between 2005-2010 that met their criteria for inclusion as evidence-based studies of Technology Enhance Learning by students. In contrast emerging areas such as MOOCs are attracting a rapidly growing number of articles, from 1 paper in each of 2008 and 2009 to 26 in 2012 (Liyanagunawardena et al., 2013) and in Learning Analytics changing the nature of research on learning and teaching as “the educational research community has started applying sophisticated algorithmic methods on gathered (mostly raw) data for understanding learning mechanisms” (Papamitsiou and Economides, 2014; 58).

4. Selected topics: MOOCs and learning analytics

Two areas of work have been picked out from these tables for further discussion. One is the area of open learning and in particular MOOCs and the way in which they can support approaches to social learning. The other is the interlinked area of design and analytics. The first of these is a good illustration of the potential impact of the innovation approach and provides a case study of the reports in action. The second highlights the interaction between different aspects of pedagogy and technology and the time taken for innovation to flow from ideas through to acceptance.

4.1 The open world of learning

The concept of the Massive Open Online Course (MOOC) has been criticised from being overhyped and irrelevant to student needs (Marcus, 2013). However there is a clear history and connection to other approaches to more open learning, value in how they are supporting learners, and signs of their impact as catalysts for change in Universities and other organisations involved in education. The period of the Innovating Pedagogy reports lines up with the time when MOOCs became part of mainstream discussion. The first use of the term was applied in around 2008 to a loosely constructed learning experience that was open for anyone to take, used open source tools and was developed as the course was taken. These original MOOCs (now termed c-MOOCs for constructivist-MOOCs) attracted numbers greater than would be expected for a paid for course of several hundred to low-thousands. In 2012 attention was heading towards the alternative of pedagogically simpler and

less radical approaches based on releasing free versions of taught courses online but with a fixed start-date and end-date. Often (incorrectly) identified as the initial MOOCs the model attracted numbers that can deserve the label “massive”; the largest single MOOC presentation to date (the FutureLearn/British Council MOOC) has achieved over 400,000 learners studying at the same time, while the Coursera presented MOOC on Learning how to Learn has accumulated over 700,000 users across several runs. These courses are part of a history of distance learning at scale. At the beginning of the last century distance education implied a correspondence model, however now models integrate support, multi media and online. The scale and experience of this more formal activity can often be overlooked but brings many lessons (McAndrew & Scanlon, 2013).

In the 2012 report one of the 10 sections was MOOCs: Massive Open Online Courses, which sets out the way in which the area was changing from the less formal “let’s put on a course here, right now” towards “emerging from early experiments into a more corporate institutional approach”. At the end of the report it noted the “enthusiasm for such open courses to provide at least a partial solution to some of the scaling issues” but also the need to consider “issues to be resolved will be in accrediting the outputs of MOOCs, and in making them financially sustainable for institutions”.

4.2 FutureLearn case

The work on MOOCs in 2012 in the publicly released Innovating Pedagogy report was mirrored in an internal report produced for The Open University that took the ideas and reflected on how they might influence internal operations. This was part of the original concept for the way the reports would work, so that they could help open up the organisation to thinking that was more outward looking and challenged current practice. The internal report considered the trends overall and described two opportunities to how their adoption could change the way that the University operated. In particular it led with the concept of the “Massively Open University” operating on the basis of free access, but with attention to the way in which that would need to be sustained by alignment to the other needs of the University, though it deliberately avoided including a business model as such. The second opportunity was described as “Seamless Social Learning” to recognise the way that learners can no longer be constrained to systems that are provided by the University but rather flow between different actions as they learn.

This report was produced in Autumn 2012, a short time before the announcement of the launch of FutureLearn (Open University, 2012) as a platform for partner universities to support Massive Open Online Courses and at the same time pay attention to social models of learning. The lead author for the Innovating Pedagogy reports was also seconded part-time to FutureLearn to provide academic leadership. It would be incorrect to assign direct cause from the work on the initial Innovating Pedagogy report to the major innovation taken by The Open University a few months later. Nonetheless there are clear benefits in providing the space for views to be developed and expressed in ways that can be shared to provide a basis for change.

4.3 Massive open social learning

The theme of MOOCs has appeared in each of the three reports from 2012 to 2014. Following its introduction in 2012, the 2013 report considered the path that MOOCs were on; highlighting their appeal to those who already had the skills to study and also the issues that were emerging in retaining learners when they are studying for free. In keeping with its aims consideration was given to the pedagogic design and why MOOCs work for some and not for others. The pedagogic strength of the typical MOOC in 2013 was clear elements of assessment and entertainment as motivation. The weakness was in support for learners and an integrated learning experience. In 2014 the focus was on an approach that has some potential to address that weakness in considering “Massive Open Social Learning”, this adjusts part of the aim in engagement from a content dimension to a social one. Research shows that the social dimension is not uniformly of appeal to learners (Godwin and McAndrew, 2008), however many of the innovations identified have a social element and as the report says “MOOCs, seamless learning, game-based learning, inquiry learning and geo-learning are all now developing as large-scale social activities”. Recognising and supporting the social element has acted to improve retention and change how a provider-led model of engagement with open learning to pay more attention to the perspective of the learner. The social element is currently a secondary driver, behind topic interest but that is changing with an increasing number attracted to MOOCs through social media connections (White et al., 2014).

5. Learning design and analytics

A further theme across the reports has been the connection between design and analytics. The 2012 and 2013 reports both considered learning analytics and the way in which greater data about learner behaviour and performance could be used to improve learning. The 2014 report considers analytics as one part of a design process. As set out in Scanlon, O'Shea & McAndrew (2015) understanding the area of learning, and in particular Technology-Enhanced Learning, has four aspects that are valuable to highlight. Its *Interdisciplinarity*, based on ideas that cross disciplinary boundaries even as its content will often focus on one particular discipline, the *Design* basis, brought out through stronger methods for describing learning intentions and then measuring and analysing the learning experience, the *Persistence* required to achieve change, and the *Bricolage* characteristics of success through innovation.

5.1 Interdisciplinarity

How we approach education has aspects of both an Art and a Science. Educators can have an instinct for what works and appreciate the Art of teaching that supports a belief that they can their message across. This is not wrong. Much can be built from custom and practice - doing what worked last time in the expectation it will work again. On the other hand, we are now in times when so much is changing in the environment and the way people live their lives. In particular access to information has been transformed, and that transformation has been mainly, but not solely, led by the technology. Seeing the elements of teaching as a Science has been slower to take hold, however tools that enable a more scientific design-driven approach are coming into place. The use learning analytics, described in the 2012 report as "Data-driven analysis of learning activities and environments" provides a set of measures for performance that give one element in taking a Scientific or design based approach, the other element is in knowing how to represent the intention in learning as a design that can be revisited and improved.



Figure 3: The design cycle

5.2 Design and analytics

Seeing learning as design has implications for how we can work with our learners. Considering a cycle of design, through activities, to data, and then analysis and reflection before feeding back to design is one way to see teaching and learning as a classic form of improvement cycle, Figure 3. As with all such representations care is needed to allow for more complex interpretations than a simple cycle. For example, analytics may well emerge during the learning experience and the reflection or adjustment to the design then reflect the growing availability of real-time or close to real-time measures. In more open structures, such as OER, the process of improving or adjusting the design may be separate from the original design, leading to multiple versions in a manner analogous to the branching of versions in open source software.

Key to the application of this cycle is the existence of both learning design and learning analytics stages and recognising their interconnected nature. Learning design is the approach to developing and representing the intent in learning materials in terms of outcomes and pedagogy. Learning analytics is the study of learner

behaviour and their progress. Together these can inform each other so that changes measured through the learning analytics can impact on the design or be used to modify student behaviour.

Without including a well-represented design stage it is difficult to understand the impact of decisions made when implementing an approach to learning, difficult to make adjustments based on feedback and performance, and difficult to share innovations and improvements with others. At The Open University there has been increasing use of a learning design representation over the last 10 years. Moving from introducing the concept and terminology through to incorporation of learning design into the module and qualification approval process and comprehensive mapping of all modules in presentation. The value of having a complete set of descriptions together with comprehensive satisfaction and performance is now apparent in the ability to analyse the impact of design. Rienties, Toetenal, & Bryan (2015) for example can now demonstrate data that shows how adding in design approaches that increase collaboration and productive tasks are not necessarily popular but do increase retention and success. The link between analytics and design enables planned change in response to measures and as reflected in the 2014 report "substantial progress has been made to use the power of learning analytics to inform and tune innovative learning designs". That progress has taken many years and as also stated in the conclusion "organisational change takes substantial time, effort and financial resources" (Sharples et al., 2014).

6. Conclusions

In this paper we have looked at the needs for innovation and how a more open approach has the potential to assist awareness and uptake for innovations. This echoes the findings of a study that showed how individual opportunities for innovation could be incubated within a more open culture. Taking the Innovating Pedagogy reports produced by The Open University as a model, we can illustrate how they are part of a more open approach to sharing academic ideas. In practice they have achieved a relatively wide readership with estimated downloads of each of the three reports reaching 10,000 copies, and increasing numbers disseminated each year. However more important is whether this approach has impact. This has been illustrated through two cases, one looking at the way The Open University itself has moved to provide a platform for massive open online courses, FutureLearn. In this case the reports show a clear connection with the work and a role in helping to trigger innovation. The other is a longer term trajectory towards a design and evidence approach to thinking about the learning experience. Learning is a key aspect of life, and the way in which we support it is under pressure, taking steps to value and support innovation may help us achieve the best for learners and meet some of the challenges in operating at the scale the world needs.

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